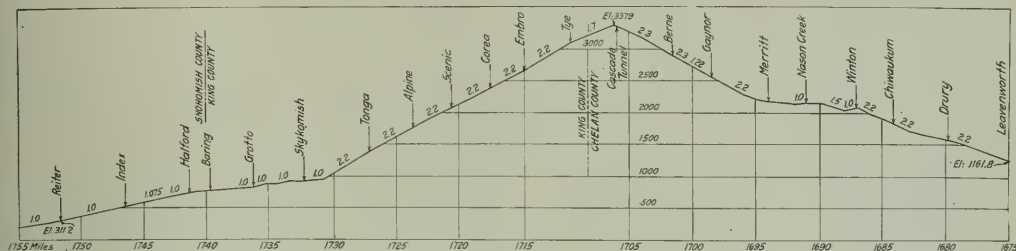


Passenger Locomotives for the Great Northern

Pacific and Mountain Types Used in Hauling Twelve-Car Transcontinental Trains Over the Heaviest Grades

The Great Northern has obtained very satisfactory service from 25 Pacific and 15 Northern or Mountain type locomotives delivered to that road about a year ago by the Lima

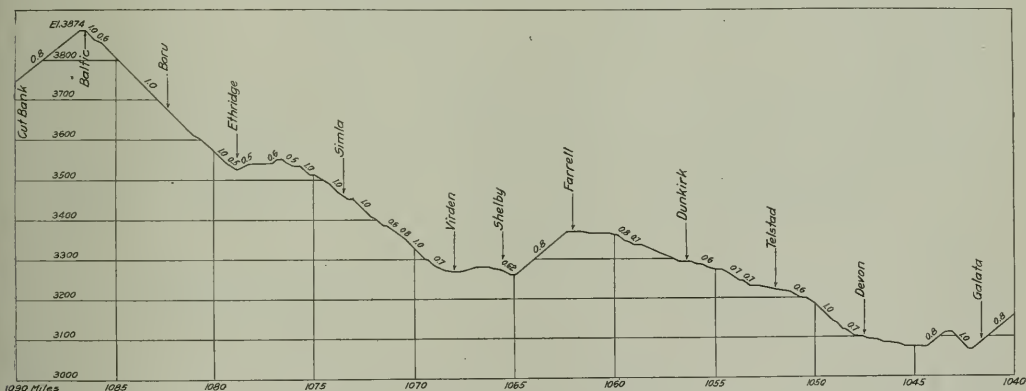
Devil's Lake to Williston, N. D., a distance of 239 miles, the crews being changed 118 miles from Devil's Lake; the third is from Williston to Havre, Mont., a distance of 309 miles,



Profile of the Great Northern from Leavenworth, Wash., Through the Cascade Tunnel

Locomotive Corporation, Lima, Ohio. The Pacific type locomotives are used on the transcontinental trains between St. Paul, Minn., and Cut Bank, Mont., a distance of about 1,072

the crews being changed at Glasgow, about half way. The fourth and last district on which the Pacific type locomotives are used is from Havre to Cut Bank, Mont., a distance of



Profile of Part of the Great Northern West of Havre, Mont.

miles. The first locomotive district is one of 408 miles, from St. Paul to Devil's Lake, N. D., the crews being changed about 217 miles out of St. Paul. The next district is between

129 miles. This portion of the road is in the foot hills of the Rocky mountains and considerable stretches of one per cent grade are encountered throughout, part of the profile



Pacific Type Locomotive for the Great Northern

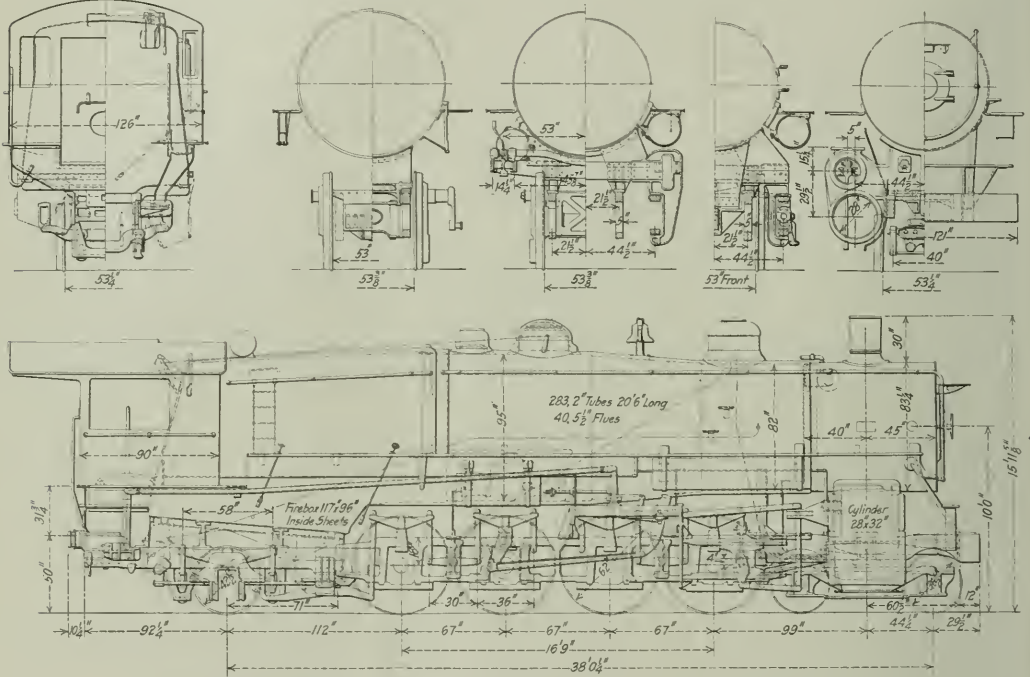
being shown in one of the illustrations. The accompanying table gives more detailed information concerning these runs:

TIME TABLE FOR THE PACIFIC TYPE LOCOMOTIVES

Stations	Dis- tances, miles	Sched. ule Stops	No. of cars	Max. grade, per cent	Time	Average speed, m. p. h.
St. Paul to Devil's Lake..	408	8	11 to 12	.72	11 hrs. 25 min.	35.7
Devil's Lake to Williston..	239	5	11 to 12	.72	6 hrs. 35 min.	34.3
Williston to Havre.....	309	5	11 to 12	...	8 hrs. 50 min.	34.8
Havre to Cut Bank.....	129	None	11 to 12	1.	4 hrs. 10 min.	30.

service has been entirely eliminated without a change being made in the time table, the Mountain type engines handling the trains at a speed of 17 to 20 m. p. h. on the 1.8 per cent grade.

The Mountain type engines have also been placed in service over the Cascade mountains, where the grade is 2.2 per cent, as shown in the accompanying profile. It will be noted that this grade is somewhat broken for a distance of 32 miles



General Arrangement of the Mountain Type Locomotive for the Great Northern

The Mountain type locomotives haul these same trains from Cut Bank to Whitefish, Mont., a distance of 129 miles. This division runs through the Rocky mountains in the vicinity of Glacier Park, and one per cent westbound and 1.8 per cent eastbound grades are encountered. Prior to putting on this type of engine in this service it was necessary to provide a helper on the eastbound run of this division for a distance of 18 miles between Essex and Summit. This helper

going west, whereas it is almost continuous running eastbound for a distance of 25 miles. In this case, as before, the use of these engines has eliminated the helper service, and they maintain a speed of 15 m. p. h. up this grade with the transcontinental trains. These engines on this hill are burning oil for fuel. Both the Pacific and Mountain type engines are said to be very good steamers and are giving an economical fuel and water performance.



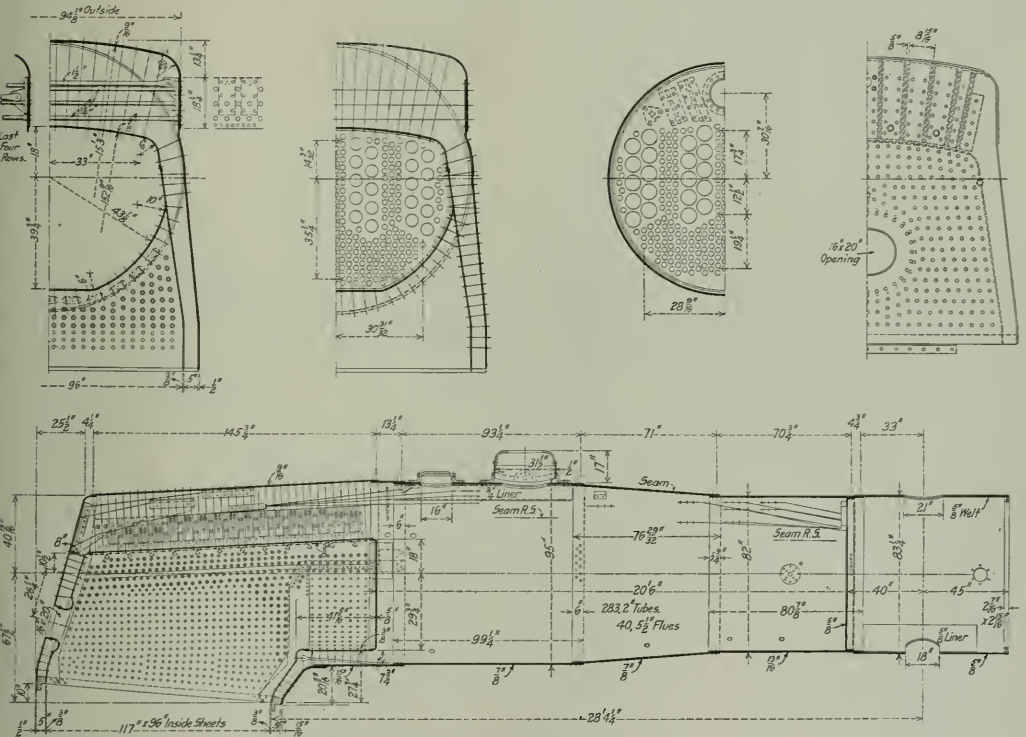
Mountain Type Locomotive for Passenger Service on the Great Northern

The Mountain type locomotives weigh 326,000 lb. in working order and have a tractive effort of 61,900 lb. They carry a boiler pressure of 180 lb., and have 28 in. by 30 in. cylinders and 62 in. driving wheels. They are equipped with Emerson superheaters, which provide a superheating surface of 1,075 sq. ft. The rigid wheel base of these engines is 16 ft. 9 in. The distance between the tires of the forward pair of drivers is 53 in., while the distance between the other drivers is 53½ in. The two leading pairs of drivers are equalized with the leading truck, while the two back pairs are equalized with the trailing truck. The forward spring hangers of the first set of driving springs support a transverse equalizer, from the middle of which is swung a longitudinal equalizer with its fulcrum on a casting attached to the guide yoke frame brace and to a waste sheet as shown in the elevation drawings. The other end of this equalizer is hung from a second longi-

drivers is 53½, and for the back drivers 53¼ in. All three pairs of drivers are equalized with the trailing truck, the cylinder casting resting directly on the center plate of the forward truck. The frames are 5 in. in width, the same as the Mountain type engines, and they are made in one piece from the front buffer to the splice in the rear of the back set of drivers. These locomotives are also equipped with the Emerson superheater, having a superheating surface of only 640 sq. ft.

Both types are equipped with the Walschaert valve gear, and the Chambers throttle valve. The leading trucks on both types of engines are the same and were designed by the railroad company. They have an 86 in. wheel base and support a load of 50,000 lb. in the case of the Mountain type locomotive and 55,000 lb. in the case of the Pacific type.

The trailing truck was designed by the Lima Locomotive



Boiler Used on the Great Northern Mountain Type Locomotive

tudinal equalizer at a point just back of the cylinder casting. This second equalizer has its fulcrum on the leading truck center casting, and its forward end is attached to the front buffer casting. This construction gives the front part of the frame ample support and tends to reduce frame breakages back of the cylinder castings. The frame is made continuous from the splice in the rear of the fourth pair of drivers through to the buffer casting. It is 5 in. wide and is braced by three frame braces and three cross bearers. The main journals on these engines are 22 in. long.

The Pacific type engines weigh 251,200 lb. in working order, and have a tractive effort of 40,500 lb. They carry a boiler pressure of 210 lb. and have 23½ in. by 30 in. cylinders; the drivers are 73 in. in diameter. The distance between tires on the forward pair of drivers is 53 in., while that for the main

Corporation and is known as the Austin truck. It is designed to simplify the removal and replacement of journal boxes and to provide a self-centering radial action of sufficient stiffness to prevent undesirable swinging of the rear end of the locomotive.

The boilers of both the Mountain type and Pacific type are of the Belpaire type and are partially equipped with Tate flexible stay bolts. The boiler of the Mountain type locomotive has a combustion chamber about 41 in. deep, which provides a tube length of 20 ft. 6 in. The Pacific locomotive, however, is not equipped with a combustion chamber and has a tube length of 21 ft. The outside diameter of the first ring of the Mountain type boiler is 82 in., while that for the Pacific type is 72 in. The cylinders of both engines are of similar design, the steam passages being

